U.S. Naval Academy
Mechanical Engineering Department
EM320 - Applied Thermodynamics
Spring 2004

08 January 2004

FROM: Course Director
TO: EM320 students

SUBJ: COURSE OBJECTIVE AND POLICY - EM320

REF: (a) USNA Catalog 2003-04
(b) MECHENGRDEPT INST 1531.16D

COURSE OBJECTIVES:
The following objectives have been set for EM320:

(1) To give the student practical examples of applications of vapor and gas power cycles for power generation and propulsion.
(2) To introduce the student to compressible flow, refrigeration cycles, air conditioning, psychrometrics, and combustion.
(3) To provide the student with exposure to physical devices which operate based on principles of thermodynamics and fluid dynamics through field trips and laboratory experiments.
(4) To provide the student with design experience through open ended problems involving practical thermodynamics systems and engineering economics.
(5) To provide the student with experience in reporting experimental results and the results of design exercises.

TEXT: *Fundamentals of Thermodynamics,6th ed.* (Sonntag, Borgnakke, and Van Wylen)

COURSE POLICIES:

General Policies:

(1) In keeping with professional engineering practice, all outside sources of information used for any work submitted in this course must be cited. "Outside sources" include all sources other than your text, course notes, and current EM320 instructor.
(2) Students are responsible for all assigned material as well as for information conveyed in class and via handouts and email.

Homework Policies:

(1) Homework should be submitted in a clear, neat manner.
(2) Collaboration with classmates in preparing homework is encouraged. However, each student must submit each assignment. Copying of homework is not acceptable.
(3) When solving a homework problem, begin by stating what is known and what is to be found. Explicitly state all assumptions as they are made. Draw a sketch of the system. Include figures, graphs, and sketches whenever they are useful to explain the solution. In general, follow the

procedure used for solving example problems in class.

(4) You may use computer programs such as EES to solve homework problems. Whether solving with the computer or by hand, always show your work in a clear and logical manner.

Test/Quiz Policies:

(1) Three exams will be given during the semester. The exam dates are provided on the Assignment Sheet. You MUST request permission IN ADVANCE for excusal from a scheduled exam.

(2) You are allowed to use one 8-1/2" x 11" sheet of paper for equations and the tables and the inside cover of the text during exams. The equation sheet may not include worked problems.

(3) Calculators, books, etc. **may not** be shared during exams.

Labs/Design Problems:

(1) Laboratory assignments will be split between physical experiments and design problems.

(2) The presentation of results for the labs and designs will be discussed in class. Memorandum Report format, as used in EM375, will be used for most.

(3) Projects and labs must be written and submitted in a professional manner.

(4) All references used in project and lab preparation must be clearly cited.

(5) Solutions will be facilitated with the computer program EES, which will be introduced in class.

GRADING: Your grade for this course will be calculated as follows:

Tests	40%
Labs/Designs	20%
Homework, Instructor Input	10%
Final exam	30%

R.J. Volino
Assoc. Prof.
Course Director

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ASSIGNMENTS

All reading and homework assignments refer to Sonntag, Borgnakke and Van Wylen, unless otherwise noted. The reading assignment should be completed **prior** to class on the date listed. Homework for each week is due on the Wednesday following the week it was assigned (e.g. problems assigned Jan 12, 13 and 14 are all due on Jan. 21). Homework submitted after the due date will receive at most half credit and will be accepted at the discretion of you instructor.

DATE		READING ASSIGNMENT	HOMEWORK
Jan 12	M	Engineering Economics - Handout	Handout
13	Tu	Rankine Cycle (11.2-11.3, 11.6)	11: 23, 31, 56, 180E
14	W	Reheat (11.4)	11: 36, 61
19	M	HOLIDAY	
20	Tu	OFWH/EES Introduction/Design 1 (11.5)	11: 41, 44, 45
21	W	CFWH/Cogeneration (11.5, 11.7)	11: 50, 181E
26	M	Compressible Flow (16.1-16.3)	16: 24, 33, 38
27	Tu	Power Plant Trip	
28	W	Nozzles and Diffusers (16.4-16.7)	16: 41, 42, 46, 80E
Feb 02	M	Shock Waves (16.8)	16: 56, 57, 59
03	Tu	Supersonic Nozzle Lab	
04	W	Vapor Compression Refrig. (11.17-11.18)	11: 119, 126, 129
09	M	Refrigerants (11.19-11.20)	11: 206E, 133
10	Tu	**EXAM #1**	
11	W	Advanced Cycles (11.23)	11: 143, 165
16	M	HOLIDAY	
17	Tu	Heat Pump/Refrigeration/Uncertainty Lab	
18	W	Gas Refrigeration (11.22)	11: 37, 39
23	M	Gas Mixtures (12.1)	12: 21, 22, 143E, 39
24	Tu	Problems	
25	W	Gas Mixtures (12.1)	12: 53, 62, 69
March 01	M	Psychrometrics (12.2-12.3)	12: 75, 77, 79
02	Tu	Adiabatic Saturation/Design 2 (12.4-12.6)	
03	W	Air Conditioning	12: 84, 91, 95, 107

DATE		READING ASSIGNMENT	HOMEWORK
08	M	Adiabatic Mixing/Evaporative Cooling	12: 104, 112, 113
09	Tu	**EXAM #2**	
10	W	Cooling Towers	12: 124, 126
15	M	**SPRING BREAK**	
16	Tu	**SPRING BREAK**	
17	W	**SPRING BREAK**	
22	M	Combustion Reactions (14.1-14.2)	14: 21, 24, 28, 37
23	Tu	Design 2 continued	
24	W	Combustion – 1^{st} Law (14.3-14.5)	14: 44, 49, 126E
29	M	Brayton Cycle (11.9)	11: 183E, 80
30	Tu	Adiabatic Flame Temperature	
31	W	Gas Turbine Combustion	14: 76, 77
Apr 05	M	Regeneration (11.10)	11: 185E, 75, 159
06	Tu	Gas Turbine Lab	
07	W	Reheat/Intercool (11.11)	11: 78, 160, 161
12	M	Aircraft Engines (11.12)	11: 91, 187E
13	Tu	Design 3	
14	W	Otto Cycle (11.14)	11: 189E, 97, 162
19	M	IC Engine Combustion	14: 110, 120
20	Tu	IC Engine Lab	
21	W	Diesel Cycle (11.15)	11: 194E, 109
26	M	Boiler Combustion (14.10)	14: 33, 58
27	Tu	**EXAM #3**	
28	W	Problems	
29	Th	Review	